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Green Revolution 2.0: Food+Energy and Environmental Security

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100-20 Use of Extended X-Ray Absorption Fine Structure Spectroscopy (EXAFS) to Differentiate the Continuum Between Phosphate Sorption Mechanisms On Goethite.

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Monday, November 1, 2010

Long Beach Convention Center, Exhibit Hall BC, Lower Level

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The dynamics and differentiation of phosphate adsorption and precipitation complex on soil surfaces has been a topic of great interest to soil and environmental scientists for decades. Until now, only circumstantial conclusions have been made, based on primarily macroscopic analyses, about adsorption versus precipitation. It is particularly important to understand the sorption mechanisms of nutrients and other elements as they provide information on the fate, release, transport and mobility of elements in the environment.

The use of EXAFS spectroscopy has been a remarkably useful technique for soil and environmental scientists to elucidate retention mechanisms of ions on mineral surfaces and speciation of contaminants in heterogeneous materials such as soils.

In this study, we determined the sorption of phosphates, i. e., orthophosphate and inositol, on goethite employing a 7-point sorption isotherm at phosphate loadings of 0, 8, 16, 32, 64, 96 and 128 mmol L⁻¹ at pH 6.0 and at three reaction times, one day, one week and one month. The Langmuir model was employed to fit the sorption data. We examined each sorption point via EXAFS analysis to determine the local atomic environment of P. This information will be useful in elucidating the sorption mechanism and differentiating between adsorption and precipitation of phosphate over time.

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